siderites, adds to the thirteen forms of that mineral previously known the three rhombohedra $(03\bar{3}2)$, $(30\bar{3}4)$, and $(10\bar{1}2)$.—Termier and Richard[16] conclude from their study of crystals of $Ca_4P_2O_9$ occurring in the slags of the iron works at Kladno, that they are pseudo-orthorhombic, composed of monoclinic lamellæ. Measurements of the apparently orthorhombic form agree well enough with those of Miers to show that both had to deal with the same substance. The specific gravity is 2.93–3.1, mean index of refraction, about 1.64. For red light, 2 V = 20° (?), and for blue light it is about 40°.—O. Nordenskiöld[17] finds edingtonite from Bôhlet, Sweden, to be orthorhombic hemihedral instead of tetragonal hemihedral, as previously supposed. Sp. G. = 2.776, plane of optical axes = 010, negative bisectrix parallel to the vertical axis, 2 V for lithium light = 52° 47′, for sodium = 52° 55, and for thallium 53° 10′. The indices of refraction for the above kinds of light are also determined. The mean index for sodium light is 1.5492, and the double refraction is .016. In conclusion, the similarity of form with that of mesotype is shown by the axial ratios:

Edingtonite a : b : c = .9872 : 1 : .6733

Mesotype a : b : 2c = .9785 : 1 : .7072

—Goldschmidt[18] figures and describes a projection goniometer by means of which the position of crystal faces is projected directly upon paper, thus doing away with the reading of angles and with trigonometrical computation. The instrument seems to be in many ways convenient, but does not give the highest degree of accuracy. A contact goniometer of similar action is also briefly mentioned.

PETROGRAPHY.[1]

Geology of Point Sal, California.—The geology of Point Sal, the extreme northwestern corner of Santa Barbara County, California, has been carefully worked out by Fairbanks[2] with special reference to the igneous rocks found there. The sedimentary rocks constituting the point and the adjacent country are of miocene or later age. They

[16] Bull. Soc. Fr. Min., XVIII, pp. 291--295, 1895.

[17] Bull. Soc. Fr. Min., XVIII, pp. 395--398, 1895.

[18] Zeitschr. f. Kryst., XXV, pp. 538--560, 1895.

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Bull. Dep. Geol. Univ. of Cal., Vol. 2, p. 1.

comprise volcanic ashes, gypsiferous clays and bituminous shales, the last named of which were regarded by Lawson as tuffs. The present author declares them to be organic deposits. The igneous rocks which penetrate these beds are all basic. They include gabbros, peridotites, basalts, diabases and rocks similar to those heretofore described as analcite diabases. These latter are all now considered by the author as representing the otherwise practically unknown type of the teschenites. The augitic variety of this rock has the general structure of the diabases, in which are large poikilitic plates of augite. Between the diabasic constituents are polyhedral grains of analcite, and, in what appear to have been cavities in the rock-mass, are little groups of crystals and crystalline masses of the same mineral. The plagioclase in the rock is all zonal with nuclei of labrodorite surrounded by concentric zones of a more and more acid feldspar, the peripheral one being albite. An analysis of a coarse grained specimen gave:

SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	K_2O	Na_2O	P_2O_5	Ign.	Total
49.61	19.18	2.12	5.01	10.05	4.94	1.04	5.62	.27	3.55	=101.39

which corresponds very nearly to 43.3 per cent feldspar, with a density of 2.57, 32.3 per cent augite, 20 per cent analcite, 4 per cent magnetite and .04 per cent apatite. All of the analcite is supposed to be an alteration product of nepheline.

The basalts of the region include two types. One is the usual variety and the other an amygdaloidal and spheroidal variety that is intruded by diabases and diabasic gabbros. These last named rocks grade into one another. Both contain hornblende, some of which is regarded as secondary and some as primary. In addition to the diabasic-gabbros there are others associated with peridotites (and serpentines) in such a manner that both rocks are regarded as differentiated products of the same magma. The gabbro is sometimes massive. At other times it is possessed of a gneissic structure, often attended by a striping produced by the alternation of augitic and feldspathic bands. The structure is concluded, after study, to be the result of stretching.

Among the other basic rocks identified in the gabbro-peridotite complex are anorthosites, diorites, norites, lherzolites, picrites, saxonites, wehrlites, dunites and pyroxenites. Each type is well described and a discussion of the banding noticed in many of them is given in some detail.

Leucite-Basanites of Vulcanello.—After studying carefully the rocks on Vulcanello in the Lispari Islands, Bäckström[3] concludes

[3] Geol. För. i Stockh. Förhanl., XVIII, p. 155.

that the greater portion of them are leucite-basanites. They all contain phenocrysts of augite, labradorite, olivine and magnetite in a groundmass which is sometimes a holocrystalline aggregate of oligoclase, orthoclase, leucite and magnetite, and at other times of numerous leucites, small augites and iron oxides in a glassy matrix. The rocks are regarded as effusive types of lamprophyres (minettes or kersantites) a supposition which is the more probable from the fact that the effusives in the Lipari province are mainly feldspathic basalts, andesites, liparites and trachytes. Biotite and leucite are thought to be complementary minerals—the former separating from a siliceous magma under considerable pressure, and the latter from a magma of the same composition under surface pressure, under conditions favorable to the escape of the mineralizers fluorine and water. Leucite is not confined to rocks rich in potash, nor is it necessarily characteristic of these. Its place may often be taken by biotite.

A Squeezed Quartz-Porphyry.—A squeezed quartz-porphyry is described by Sederholm[4] as occurring at two places in the Parish of Karvia in Province Abo, Finland. In both it appears as dykes cutting granite. The rock consists mainly of microcline phenocrysts to which are often added growths of new microcline in optical continuity with the original crystals, phenocrysts of an acid plagioclase surrounded in many cases by microcline substance and quartz phenocrysts in a groundmass of orthoclase and quartz. The twinning of the microcline is more largely developed around quartz enclosures in the phenocrysts and near quartz veins than elsewhere in the crystals. The porphyritic quartzes occasionally retain their dehenhedral contours, but usually they are much deformed in outline and in their optical characteristics. Often the quartzes are so shattered that they now constitute lenticular areas of a quartz mosaic. The structure of the groundmass is in several types. In the most important one it consists of a micropegmatite of orthoclase and quartz containing shreds of chlorite, which in some cases are distributed so as to exhibit a fluidal arrangement. The granite through which the porphyry cuts is a coarse grained porphyritic variety composed of oligoclase, biotite and hornblende. On the contact with the dyke rocks it is crushed and much epidote is developed in it. Under the microscope it presents the usual aspects of a dynamically metamorphosed rock. In his discussion concerning the name to be applied to the porphyry, the author quotes from a letter by Dr. Williams in which the prefix 'apo' is defined as signifying that the rock

[4] Bull. Com. Geol. d'Finlande, No. 2, 1895.

to which it refers has been changed from its original character through devitrification.

Mica-Syenites at Rothschonberg.—Two dykes of mica-syenite cut the phyllite formation near Rothschönberg, Saxony, producing in the neighboring rocks contact metamorphism. One of the dykes weathers spheroidally, and in the kernels of the spheroids fresh material for study was afforded Henderson,[5] who found the rock to be composed of orthoclase, plagioclase, quartz, biotite, apatite and several accessory components. The feldspar and quartz both occur in grains and in crystals, the biotite in flakes. An analysis of the rock gave the figures below (I).

The second occurrence differs little from the first. Muscovite is present as well as biotite, otherwise the two rocks are practically alike in mineral composition. Its chemical composition is shown in (II).

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	H_2O	CO_2	S	Total
I.	61.40	16.66	7.46	2.08	3.65	2.93	4.75	.76	1.54	.20	=101.43
II.	57.63	16.47	5.37	5.25	4.44	3.12	5.15	.45	2.14	.95	=100.97

The structure of both rocks was panidiomorphic, although the development of secondary quartz renders them now hypidiomorphic. They are syenitic aplites. In the neighboring phyllites new biotite has been abundantly developed and hornblende has been produced in some quantity. The free silica which is abundant in the unaltered phyllites has become combined with metallic elements in the altered forms. While the percentage of silica in specimens taken at 2 meters and 11 meters from the contact and at the contact is the same, the free quartz in the first is 43.38 per cent of the rock's mass, in the second 38.94 per cent and in the third 34.06 per cent.

GEOLOGY AND PALEONTOLOGY.

Cambrian Rocks of Pennsylvania.—During the years 1892 and '93, Mr. Walcott made an examination of the rocks of Cambrian southeastern Pennsylvania for the purpose of determining whether the lower quartzites with their superjacent limestones were of the same geologic age, in the areas included between the Potomac and Susquehanna and the Delaware and Susquehanna Rivers. The results of his work are published in bulletin form by the U. S. Geological Survey.

[5] Zeits. d. geol. Ges., XLVII, p. 534.